

Use of satellite and ground-based images to monitor dust storms and map landscape vulnerability to wind erosion

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Abstract

Wind-induced dust emission in the Southwestern United States is important regionally because of its impact on human health and safety and its influence on ecosystem dynamics. Wind velocity, sediment availability, and surface conditions are important factors that determine landscape vulnerability to wind erosion. We are investigating remotely sensed satellite, airborne, and ground-based image data to detect and monitor active dust storms, as well as to map areas vulnerable to wind erosion in the Mojave Desert of the Southwest United States. Data collected by various satellite imaging systems, a ground-based digital camera station, and several in-the-field instruments during several dust storms are being used to correlate landscape characteristics to wind erosion vulnerability. Multispectral satellite images were used to generate a wind erosion vulnerability image that represents a first-order vulnerability image map, with field data and observations being used to validate the results. The GOES satellite imaging system is the only one available that has the required temporal resolution to detect and monitor active dust storms; however, its spatial and spectral resolutions are low, and only very large dust storms can be detected. A satellite imaging system with three to five spectral bands and approximately 100 m spatial and 15 to 30 minutes temporal resolutions is needed to effectively monitor short-lived events.